Adult male emu and young. The chicks are about three weeks old. The smallest bird was released from the shell by the keeper

The birds grow rapidly. Here are the young emu, shown on the left, as they appear when at the age of three months

The Emu in Captivity*

Peculiar Habits That Make Breeding Difficult

By Lee S. Crandall

WHEN our devoted male emu first became a father, his inexperience in rearing emus was equalled by our own. Young parents are proverbially foolish, and when a mother with advanced ideas refuses to accept the responsibility of caring for her offspring, a domestic calamity threatens.

But feminine slackers are quite the usual thing in emu families. Ages before the first lady of our own race conceived the idea that she was much too busy to be bothered with the care of babies, Mrs. Emu had turned over to her mate the drudgery of the nursery. She felt that the production of eight or nine delicately-tinted green eggs, artistically etched over with a darker shade, was burden enough for one who wished to be more than a mere household slave.

In Australia, emus at liberty breed from April to November. Just why our birds should decide that, in New York, January offered the most suitable conditions, still is a mystery.¹ At any rate, our first emu egg appeared on a frosty morning early in 1915. Its advent caused little excitement in the emu colony. The prospective father appeared unsuspecting of impending fate. The mother was indifferent concerning the future. Their combined intelligences were unequal to the task of protecting the egg from frost, and instinct had had no experience with such an emergency. The egg froze and burst.

Birds are actuated chiefly by instinct. Since this influence, unaided, seemed insufficient to cope with 10° Fahrenheit, reason, in the form of a rounded stone coated with green paint, came to its assistance. The female emu was persistently watched by her keepers and the instant the next egg appeared, the stone was substituted for it. Not that it really mattered, for neither bird was at all interested.

By this means, six perfect eggs were accumulated. When instinct suddenly convinced the male that nothing could be more attractive than reclining on a bed formed of three large, hard stones, the six eggs were entrusted to his care. As already recorded,² after many difficulties caused by the untried state of all the principals, one baby bird was safely hatched and finally reared.

After this successful experience, we all felt that emu broods would become a matter of yearly routine. But we had planned without proper consideration of father-love. The emu was fond of his chick. There could be no doubt of that. So deep was the mutual attachment that neither bird could endure life beyond the sight of the other. As autumn approached, we viewed the strength of this feeling with some misgivings, for the period of courtship was approaching, and there was no indication that filial affection would tolerate encroachment.

In November, it became evident that father and son must be separated if the mother was to be restored to her rightful position. The chick, now well grown, was driven into an adjoining corral, separated by a wire fence. An emu's method of combatting material obstacles is to kick

hard. A wire fence is a dangerous antagonist, because it is too springy to be affected by a blow, but is very likely to enmesh the trip-hammer feet. The distress of both birds took such a violent form that only a quick reunion prevented damage to property and limbs.

But, however distressing it might be, the family bond had to be severed. After a struggle, the young bird was seized and carried bodily to a large stall inside the Yak Shelter. Here were only smooth, discouraging walls to kick against, and the prisoner soon became reconciled.

In spite of our well-meant efforts, a connubial reconciliation did not take place. The male finally came to tolerate his erstwhile mate, but that was all. Autumn chilled to winter, and with the coming of spring, the young bird emerged from his indoor imprisonment and rejoined his parents. He was now nearly as large as they, and distinguishable only by the practiced eye.

Early in the next winter, there were evidences of renewed affection between the old pair. In February, 1917, matters had so well progressed that a frozen egg was found one morning in a corner of the corral. Now came a demonstration of the value of experience. A stone egg was quickly produced and placed on the floor of the indoor shelter. The bird showed the deepest interest in the substituted egg, and covered it carefully with straw and debris, which was rearranged daily. The indifference of callow youth had been replaced by the solicitude of maturity. Our emu had become a professional father.

The female was, if possible, even more irresponsible than ever. Her eggs were deposited in every corner of the enclosure, at intervals varying from four days to a week. Only the vigilance of her keeper prevented the loss of every one. As each egg was laid, a wooden or stone imitation was placed in the shelter. Here they were received, covered and duly inspected in good faith by the male.

After six had accumulated, the bird became broody and spent much of his time in sitting about on the ground. He continued to look after the eggs, but made no effort to begin incubation.

Two vestibules lead to the inner room occupied in winter by the emus. We had wished the bird to make his nest in the smaller one, for its dimensions were more suitable for arranging the nest. But the vagaries of instinct again became evident. The bird refused to brood there. A lovely nest of fresh, green sod, occupied by five attractive dummy eggs, could not lure him. He often peeked in at the door of the proposed nursery, but although the eggs had been there from the first, he now refused to enter.

Fearing that the fatherly impulse might pass, we removed the nest from the first vestibule to the one of the bird's choice. It evidently accorded with his notion, for he lost no time in taking up his eight weeks' vigil.

Three eggs, perhaps frosted, later had to be removed, but eventually three beautifully-striped chicks appeared. The third had difficulty in extricating itself, and was saved by the efficiency of the keeper. The young birds have grown beyond expectation, and are much brighter

and more active than the one of two years ago. Perhaps it is not surprising, for their father is now a model foster mother.

Increasing T.N.T. Supplies

ONE of the surprises of the present war has been the great explosive power of tri-nitro-toluene, better known under its abbreviated form of T. N. T. The explosive used in the Boer War was principally lyddite, and the basis of this and many other similar explosives was, or perhaps we should say is, for it is probably still in use, picric acid. T. N. T. is the next step upwards in the same chemical series. The power of the modern torpedo, which has had so great an effect upon naval tactics is due to T. N. T., and probably much of the high explosives used to pulverize trenches and dugouts and create the great shell-craters consists of the same substance. Practically the only commercial source of benzol and toluol, from which lyddite and T. N. T. are made, is coal tar oil; and, as a consequence, all the gasworks in the kingdom have been doing their utmost to obtain as much as possible of this substance for the Minister of Munitions. The demand, however, has exceeded the supply, and, accordingly, attention has been directed to coal-gas itself, the illuminating properties of which, when burnt in a flat-flame burner, are due almost entirely to small quantities of benzol and toluol contained in the gas.

Up to the present only a comparatively small proportion—much less than half—has been recovered. The description by Dr. R. Lessing at a recent meeting of the Society of Chemical Industry, of a process for the complete recovery of the benzol and toluol in coal gas, by means of which it will be possible to obtain about two gallons of benzol and a tenth of that quantity of toluol from every 10,000 cubic feet of gas, is particularly opportune. This is a discovery which will prove as useful in peace as in war, for benzol and toluol form the basis of most of our coal-tar colors, and will prove invaluable to our rapidly-growing dye industry, which is making gigantic strides towards filling the place formerly occupied by the German dye works. Further, we have here a prolific source of home-produced fuel for our internal-combustion engines.

Benzol, before the war, was coming rapidly into favor for driving these engines, though only about one-tenth as much benzol was used as petrol. After the war we ought to be producing in this country at least five times as much benzol as in 1914. Such a supply should mean the freeing of a very large amount of tonnage—and tonnage will be scarce for a long time after peace is declared. In fact, the whole of the petrol previously imported could be done without by us if the home-produced fuel-alcohol question were properly tackled. There is good reason to suppose that the new Board of Fuel Research will give particular attention to the future of alcohol as a fuel. It has been estimated that fuel alcohol could be produced for 3d per gallon. Mixed with an equal quantity of benzol we have an ideal fuel that can be used without engine alteration.—*London Daily Telegraph*.

*From the *Bulletin* of the New York Zoological Society.

¹In Australia the summer month of January is the equivalent of our July. M. G.

²*Bulletin*, Vol. XVIII, No. 5, September, 1915.